

## Implementation of Random Shuffle Algorithm to Randomize Questions in Anti-Corruption Prevention Game

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#### Article History:

Submitted: 06-11-2023

Accepted: 09-11-2023

Published: 13-11-2023

#### Keywords:

Shuffle Algorithm; Anti-Corruption; MDLC

#### Brilliance: Research of

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### ABSTRACT

Socializing anti-corruption education in Indonesia is crucial to fostering public aversion towards corruption. Games are a highly effective medium for disseminating anti-corruption prevention during school years. This research aims to implement anti-corruption education within a game using the shuffle random algorithm to ensure the successful randomization of anti-corruption questions. This anti-corruption educational game requires an algorithm that can randomize questions accurately. Each question displayed should be unique so that users can explore different questions. The shuffle algorithm is a simple and accurate randomization method to sort index data from records or tables. In programming languages, the shuffle function not only randomizes numbers but can also randomize the position of strings and combinations of strings and numbers. By making an anti-corruption educational game with a random mixing algorithm, it aims to instil honesty and national values in children who play this game and form anti-corruption characters. This data was obtained through a literature review. The method used in this study is the Multimedia Development Life Cycle (MDLC). The results of this research indicate that the testing yielded a 100% accuracy rate for the shuffle random algorithm in randomizing the questions. The accuracy rate demonstrates that the shuffle random algorithm can effectively randomize the questions and is easy to implement.

### INTRODUCTION

The advancement of technology that is remarkably developed at this time forces us to coexist with technology. The relationship between technology and early childhood is no exception, where now they are straightforward to surf the internet and play the games they like (Paremeswara & Lestari, n.d.)

Nowadays, gadgets are commonplace for children. It is easy to find elementary and middle school children playing devices with agility. The application that many of them open is games, and this is also a pro and con for parents in giving gadgets to their children, so supervision is needed when they play devices (Riski Yasinia et al., n.d.)

Early anti-corruption education is an emergency that must be taught to elementary school students or junior high school students today (Sri et al., n.d.) Corruption is a hazardous practice for those who illegally enrich themselves or others or businesses and can be detrimental to a country or its economy. To eradicate corruption, we must spread the fight against corruption. This can happen indirectly through educational games. Educational games are a very effective social tool, but games can now be a play and learning tool for children (Kurniasari, 2019)

Educational games are an exciting way to socialize. In anti-corruption games, the questions should be randomized so that the questions that appear are always unique so that users can find different questions related to nationalism. Digital games have become a popular form of play for children. The purpose of educational games is to promote anti-corruption socialization to ensure the growth of an anti-corruption culture since childhood (Harpad et al., 2019)

Several studies have proposed algorithmic techniques to randomize sequences of numbers, text, or dates. These methods include Fisher-Yates shuffling and naive shuffling algorithms. By using these methods, data can be randomized in such a way that the data does not repeat (Juniawan & Hengki, 2019)

The Fisher-Yates shuffling algorithm and the simple shuffling algorithm each have their advantages. The Fisher-Yates shuffling algorithm is a good balance for randomizing numbers, text or data but has the disadvantage that it does not work by itself and requires the help of other algorithms. The simple mixing algorithm has the advantage of mixing data uniformly, but the disadvantage is poor accuracy (Asih et al., 2020)

This anti-corruption educational game requires an algorithm that can randomize questions accurately. Each question displayed should be unique so that users can explore different questions. The shuffle algorithm is a simple and



accurate randomization method to sort index data from records or tables. In programming languages, the shuffle function not only randomizes numbers but can also randomize the position of strings and combinations of strings and numbers. By making an anti-corruption educational game with a random mixing algorithm, it aims to instil honesty and national values in children who play this game and form anti-corruption characters (Rahman & Asror, 2019).

## LITERATURE REVIEW

### THE CONCEPT RANDOM SHUFFLE ARGORITHM

This algorithm randomizes the index order of a record or table. This shuffling is like shuffling cards; all the cards are shuffled in such a way that the order is randomized. Another example: Suppose A is a 5 x 1 array,  $A = [ 1 \ 2 \ 3 \ 4 \ 5 ]$ , then the random shuffle process will change the array index array A to  $A1 = [ 5 \ 1 \ 3 \ 2 \ 4 ]$  or second, randomize the matrix array In programming languages, the random shuffle function can not only randomize numbers but also randomize the arrangement of strings or a mixture of strings and numbers (Yusnita & Rija'i, 2019)

To put it simply, this algorithm applies randomization to unscrambled question positions so that the questions are still in order.

Table 1. Questions before randomization

Question 1	Question 2	Question 3	Question 4	question 5
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Randomized question position after applying the Random Shuffle algorithm

Table 2. Questions After randomization

Question 4	Question 2	Question 5	Question 3	Question 1
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## METHOD

### MULTIMEDIA LIFE CYCLE (MDLC) METHOD

The Multimedia Development Life Cycle model consists of six steps. The following are steps in the MDLC (Nurfitri et al., 2023):

1. Concept  
This phase is the basis for determining the program's purpose (entertainment, learning, information, etc.), the general definition, and users (public identification).
2. Design  
The design phase is where program specifications are created, such as B. Material requirements for the program, program layout, and program architecture. The design phase includes program structure, flowchart, use case diagram, and storyboard.
3. Material Collecting  
At the material collection stage, materials are collected as needed. These materials include images, audio, objects, animations, scripts, and more, available for free or according to design.
4. Assembly  
The assembly phase is the phase of creating all multimedia materials. Programming is based on the design phase, such as storyboards, flowcharts, use case diagrams, and program structures.
5. Testing  
This step is carried out after the assembly step is complete. This phase is divided into two parts: factory testing (alpha testing) and end-user testing (beta testing).
6. Distribution  
At this stage, the program is saved to online and offline storage to be shared with users directly or online. This phase is also called the evaluation phase evaluation phase of the existing development to improve it. The results of this assessment can be used as input for the next maintenance phase. Figure 1 below is an overview of the Multimedia Development Life Cycle (MDLC) method:

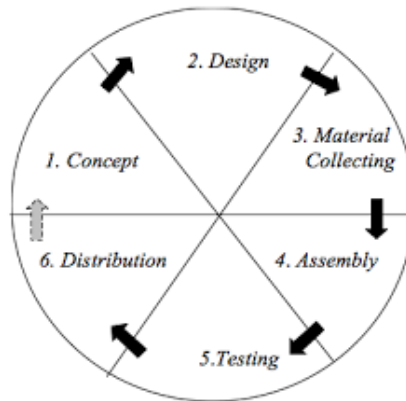


Figure 1. MDLC Method

## RESULT

### Concept

This phase is the basis for determining the purpose of the program (entertainment, learning, information, etc.), the general definition and users of the program (public identification). this game concept is a quiz about anti-corruption prevention based on android

### Design

To start designing this game, a flowchart of the sequence of stages of the game process when played is made.

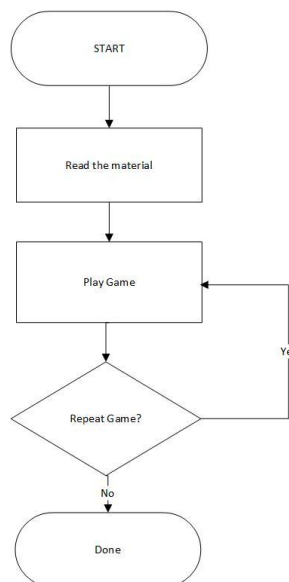


Figure 2. Flowchart Game

### Material Collecting

At the material collection stage, materials are collected as needed. These materials include images, audio, objects, animations, scripts, and more, available for free or according to design.

### Main Menu

This main menu page has several buttons that can be used to link to other pages such as B. "Start game", "Music", and "Exit" buttons. When the user presses the "Start" button, the game starts. The "Music" button turns on and off the music in the game, while the "Exit" button exits the game.



Figure 3. Main Menu

### Start Game Menu

When the user presses the start game button, the game will start automatically, and the timer and score will be active. In this menu, users race against time and answer in-game questions about anti-corruption training. Each correct answer is worth 10 points, and the questions that appear will randomize the results of the random mixing method used.



Figure 4. Start Game Menu

### Correct Answer Display

When the user answers a question, it displays an Emoticon that reads awesome. This is the icon when the user answers the question correctly.



Figure 5. Correct Answer Display

### Wrong Answer Display

When the user answers the question incorrectly, an emoticon with incorrect writing will appear, as shown in Figure 6.



Figure 6. Wrong Answer Display

### Game hint display

Users can read the question instructions before starting the game This menu can be found on the main menu display of the game

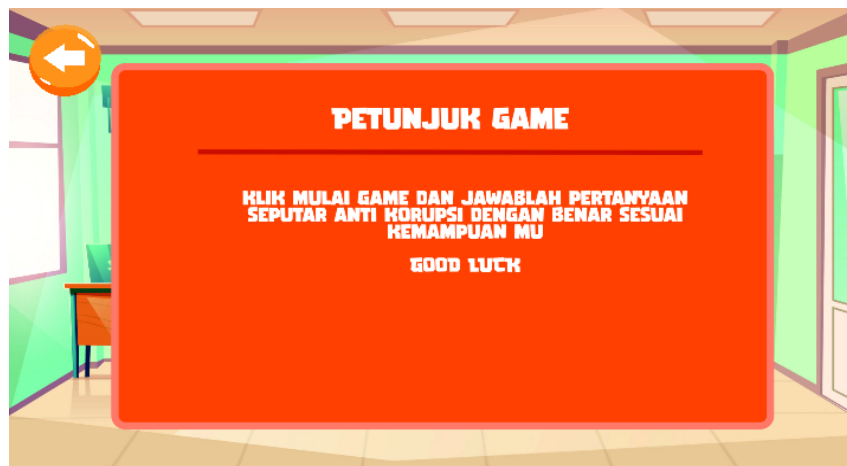


Figure 7. Game Hint Display

### Final Result Score Display

When the user has answered all the questions that appear randomly, the final results that appear are the correct answer value, the wrong answer value, and the final score. The user can try again by pressing the retry button or return to the main menu by pressing the main menu button.



Figure 8. Final Score

**Assembly**

The assembly phase is the phase of creating all multimedia materials. Programming is based on the design phase, such as storyboards, flowcharts, use case diagrams, and program structures. At this stage, assembly uses the unity program android programming.

**Testing**

This step is carried out after the assembly step is complete. This phase is divided into two parts: factory testing (alpha testing) and end-user testing (beta testing).

**Distribution**

At this stage, the program is saved to online and offline storage so that it can be shared with users directly or online. This phase is also called the evaluation phase evaluation phase of the existing development to improve it. The results of this assessment can be used as input for the next phase of maintenance.

**DISCUSSION**

**Implementation of Shuffle Random Algorithm in Anti-Corruption Prevention Game**

The Shuffle Random algorithm is implemented with the following flow:

1. Students run the game
2. After entering the main game menu, they can read the material about anti-corruption first
3. After reading the material, students press the start button to play the game
4. Display the results of the quiz questions about anti-corruption that have been randomized.

**Shuffle Random Algorithm Calculation**

In the anti-corruption game, suppose there are 10 quiz questions to be randomized. Then get array length (m) = 10. The steps for randomizing quiz questions in anti-corruption games using the Random Shuffle Algorithm are as follows:

1. Take one question randomly (i). The value of i that can be taken is the value that is still in the Range 1-10.
2. The value of I taken is exchanged for the mth quiz question (the value of m is the limited number of questions). The value of m is 10. The position of the value i that has been randomly taken is exchanged for the value m, which is 10.
3. Repetition will be done until the value to be randomized is no longer available. The following is a table of examples of randomization using the Random Shuffle Algorithm with the number of arrays array (m) = 10.

Table 3. Randomization Random Shuffle Algorithm

Step	Range	Roll	Scratch	Result
			1 2 3 4 5 6 7 8 9 10	
1	1-10	7	1 2 3 4 5 6 8 9 10	7
2	1-9	3	1 2 4 5 6 8 9 10	3 7
3	1-8	1	2 3 5 6 8 9 10	1 3 7
4	1-7	6	2 4 5 8 9 10	6 1 3 7
5	1-6	9	2 4 5 8 10	9 6 1 3 7
6	1-5	4	2 5 8 10	4 9 6 1 3 7
7	1-4	10	2 5 8	10 4 9 6 1 3 7
8	1-3	8	2 5	8 10 4 9 6 1 3 7
9	1-2	2	5	5 8 10 4 9 6 1 3 7

Table 3 explains that Step is the sequence of steps in the randomization process, Range is the number of numbers that have not been selected, Roll is the set random number, Scratch is the number that has not been chosen during randomization, Result is the Result of the permutation that will be obtained after the randomization of the problem.

**Evaluation**

At this evaluation stage, there is a test of the effectiveness of this game when used, which aims to evaluate the success of the board game that has been made by comparing student learning outcomes before and after playing this anti-corruption educational game. Before using the media, students are given an initial test (pre-test). Then, students



are invited to learn in a quiz game about anti-corruption. After using the press, students took the second test (post-test).

The testing method used by the author is pre-test and post-test. Pre-tests and post-tests are tests conducted to determine the comparison of results. The author chose the pre-test and post-test because this test compares the level of knowledge of corruption prevention courses (Prihandoko et al., 2021)

After the author's "Anti-corruption Prevention" educational game application passed the self-test stage, the user directly tested the application. Because the primary target users of this "Anti-corruption Prevention" educational game are ninth-grade high school students. The author conducted a user test involving 10 students using the pretest and post-test methods. This was to measure the users' knowledge and understanding of anti-corruption training before and after playing the Anti-corruption Prevention game. The author gave the users an overview of what the anti-corruption match is and how to play it. The author then distributes pretest questionnaires to users after they have completed the pretest user survey to test the Corruption Prevention game application. When users have played enough, the author issues a post-test questionnaire where the post-test questions are the same as the pretest questions, except that the order of the questions is randomized.

Table 4. Pre-Test and Post Test Data

Pre & Post No	Student Name	Class	Age	Pre-Test Score	Post-Test Score
1	Ira	IX	15	40	70
2	Mustamin	IX	15	30	60
3	Ikram	IX	15	40	50
4	Edgar	IX	15	20	60
5	Yuda	IX	14	30	60
6	Melani	IX	15	60	70
7	Jodi	IX	14	60	70
8	AKbar	IX	15	60	80
9	Ikhsan	IX	15	40	50
10	Yogi	IX	15	40	50

Table 4 shows that students who played the anti-corruption game had slightly different knowledge about anti-corruption education than before playing the anti-corruption game. Although from these results, it cannot be concluded that children's understanding of corruption prevention can be improved after this game, getting children used to being exposed to information through various media, especially games, can offer behavioral changes in society and can get used to understanding the dangers of this practice. Corruption from an early age can harm yourself and the country. Breakdown from an early age because it can hurt yourself and the government.

Table 5. Paired Samples Statistic

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	before playing the anti-corruption educational game	42,0000	10	13,98412	4,42217
	after playing the anti-corruption educational game	62,0000	10	10,32796	3,26599

A paired T-test statistic is a parametric test used on two paired data. This test expects to see if there is an average difference between two samples that are paired or related. Because it is paired, the data from the two samples must have the same amount or come from the same source. In the study, a sample of values was taken before students played the game and after students played the game.

Table 6. Paired Sample Test Result

		Paired Samples Test							Sig. (2-tailed)
		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	
					Lower	Upper			
Pair 1	Before playing the anti-corruption educational game-after playing the anti-corruption educational game	-20,00000	11,54701	3,65148	-28,26023	-11,73977	-5,477	9	,039

The results of the Paired t-test test show that the significant value of 0.39 is less than 5%, so the data shows a considerable difference. Data shows a significant difference. Anti-corruption educational games can be declared effective for use. This study also uses qualitative data on student opinions to determine student responses to anti-corruption prevention educational games.

### CONCLUSION

Based on the test results and discussion, the researchers concluded that the implementation of the random shuffle algorithm in this anti-corruption educational game runs well by randomizing questions consistently and not colliding with other questions and answer buttons. Testing this anti-corruption prevention educational game concluded that this game can increase students' knowledge of anti-corruption education if played consistently by learning the materials in the game.

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